

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) An objective unit to be mounted on a revolver of ~~an optical~~ a microscope apparatus for observation, the revolver facilitating switching among a plurality of objective ~~lenses~~ units, the objective unit comprising:

an objective lens;

an objective frame that holds the objective lens;

an outer frame member with a hollow cylindrical shape that, as a sheath of the objective unit, houses the objective frame and has thereinside, the outer frame member having a connecting portion to be integrally connected with the revolver;

an objective holder that is provided ~~on~~ inside the outer frame member and holds the objective frame in such a manner that the objective frame is movable in a direction of an optical axis of the objective lens; and

at least one actuator that causes relative movement between the objective frame and the outer frame member in the direction of the optical axis of the objective lens to thereby drive the objective lens in the direction of the optical axis while the objective unit and the revolver being integrally connected with one another.

2. (Original) An objective unit according to claim 1, wherein light incident on said objective lens satisfies the following condition:

$$I_{\text{off}} / I_{\text{on}} \geq 0.135$$

where I_{on} is a light intensity at a center of illumination light and I_{off} is a light intensity at a position of a radius of $d + D_p / 2$ from the center of said illumination light, where D_p is a pupil diameter of said objective lens and d is a maximum amount of movement of said objective lens

moved by said actuator, that is, a distance from the center of said illumination light to an optical axis of said objective lens.

3. (Original) An objective unit according to claim 2, further comprising an element which combines a light source with a photodetector and a relay optical system which introduces light from said element into said objective lens and at the same time, introduces again signal light from a specimen, passing through said objective lens, into said element.

4. (Original) An objective unit according to claim 2, further comprising a light source, a photodetector, and a light splitting and combining member which introduces light from said light source into said objective lens and introduces signal light passing through said objective lens into said photodetector.

5. (Previously Presented) An objective unit according to claim 2, wherein the at least one actuator comprises a first actuator is placed to move the objective lens in a first direction, a second actuator placed to move the objective lens in a second direction different from the first direction, and a third actuator placed to move the objective lens in a third direction different from each of the first direction and the second direction.

6. (Original) An objective unit according to claim 2, wherein said outer frame member has a plane-parallel transparent member, said transparent member being placed at a top of said objective lens.

7. (Previously Presented) An objective unit according to claim 2, wherein said objective holder holds a plurality of objective lenses.

8. (Previously Presented) An objective unit according to claim 7, wherein said outer frame member has a plurality of units, each including said objective lens, said objective holder, and said actuator.

9. (Currently Amended) ~~An optical~~ A microscope apparatus comprising:

a revolver that facilitates switching among a plurality of objective ~~lenses~~ units; and

an objective unit mountable on the revolver, the objective unit comprising:

an objective lens;

an objective frame that holds the objective lens;

an outer frame member with a hollow cylindrical shape that, as a sheath of the objective unit, houses the objective frame and has ~~thereinside~~, the outer frame member having a connecting portion integrally connected with the revolver;

an objective holder that is provided ~~on~~ inside the outer frame member and holds the objective frame in such a manner that the objective frame is movable in a direction of an optical axis of the objective lens; and

at least one actuator that causes relative displacement between the objective frame and the outer frame member in the direction of the optical axis of the objective lens to thereby drive the objective lens in the direction of the optical axis while the objective unit and the revolver being integrally connected with one another.

10. (Original) An optical apparatus according to claim 9, wherein light incident on said objective lens satisfies the following condition:

$$I_{\text{off}} / I_{\text{on}} \geq 0.135$$

where I_{on} is a light intensity at a center of illumination light and I_{off} is a light intensity at a position of a radius of $d + D_p / 2$ from the center of said illumination light, where D_p is a pupil diameter of said objective lens and d is a maximum amount of movement of said objective lens moved by said actuator, that is, a distance from the center of said illumination light to an optical axis of said objective lens.

11. (Original) An optical apparatus according to claim 10, wherein said objective unit has an element which combines a light source with a photodetector and a relay optical system which introduces light from said element into said objective lens and at the same time, introduces again signal light from a specimen, passing through said objective lens, into said element.

12. (Original) An optical apparatus according to claim 10, wherein said objective unit has a light source, a photodetector, and a light splitting and combining member which introduces light from said light source into said objective lens and introduces signal light passing through said objective lens into said photodetector.

13. (Original) An optical apparatus according to claim 10, wherein said objective unit has three sets of actuators so that a first actuator is placed to move said objective lens in a first direction, a second actuator is placed to move said objective lens in a second direction different from said first direction, and a third actuator is placed to move said objective lens in a third direction different from each of said first direction and said second direction.

14. (Original) An optical apparatus according to claim 10, further having an illumination and detection unit including a light source, a photodetector, and a light splitting and combining member which introduces light from said light source into said objective lens and introduces signal light passing through said objective lens into said photodetector.

15. (Original) An optical apparatus according to claim 10, wherein a plane-parallel transparent member is placed at a top of said objective lens.

16. (Previously Presented) An optical apparatus according to claim 10, wherein said objective holder holds a plurality of objective lenses, and said optical apparatus has beam diameter converting means for producing a light beam which is incident on all said plurality of objective lenses, and a plurality of photodetectors.

17. (Previously Presented) An optical apparatus according to claim 10, wherein said outer frame member has a plurality of units, each including said objective lens, said objective holder, and said actuator.

18. (Currently Amended) An observation method using ~~an optical~~ a microscope apparatus, comprising:

mounting an objective unit on a revolver that facilitates switching among a plurality of objective lenses units, the objective unit including:

an objective lens,

an objective frame that holds the objective lens,

an outer frame member with a hollow cylindrical shape that, as a sheath of the objective unit, houses the objective frame and has ~~thereinside~~, the outer frame member having a connecting portion integrally connected with the revolver,

an objective holder that is provided ~~on~~ inside the outer frame member and holds the objective frame in such a manner that the objective frame is movable in a direction of an optical axis of the objective lens, and

at least one actuator that causes relative movement between the objective frame and the outer frame member in the direction of the optical axis of the objective lens to thereby drive the objective lens in the direction of the optical axis while the objective unit and the revolver being integrally connected with one another,

arranging a plane-parallel transparent member before the objective lens, and

filling a space between the transparent member and a specimen with a transparent liquid medium, to observe the specimen.

19. (Original) An observation method according to claim 18, wherein a space between said objective lens and said transparent member is filled with a different transparent liquid medium of substantially the same refractive index as a refractive index of said transparent liquid medium.